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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/060,737	01/30/2002	Po-Hao Adam Huang	510015-253	7003

33717 7590 07/21/2005

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EXAMINER

LEUNG, JENNIFER A

ART UNIT PAPER NUMBER

1764

DATE MAILED: 07/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/060,737

Applicant(s)

HUANG ET AL.

Examiner

Jennifer A. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-5,8,10-12,14,15,17-19,22,26-28 and 32 is/are pending in the application.
- 4a) Of the above claim(s) 20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-5,8,10-12,14,15,17-19,22,26-28 and 32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date. _____  | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 7, 2005 has been entered.

### ***Response to Amendment***

2. Applicant's amendment submitted on March 4, 2005 has been received and carefully considered. Claims 2, 6, 7, 9, 13, 16, 21, 23-25, 29, 30, 31 and 33-35 are cancelled. Claim 20 is withdrawn. Claims 1, 3-5, 8, 10-12, 14, 15, 17-19, 22, 26-28 and 32 are active.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 3-5, 8, 10-12, 14, 15, 17-19, 22, 26-28 and 32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, it is unclear as to whether applicant is attempting to claim "A system for mixing and combusting chemicals" or the combination of "A system for mixing and combusting chemicals" and "a micro-machined chemical-mixing device". Also, "the device" (line 3) lacks proper positive antecedent basis, because "a micro-machined chemical-mixing

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device” is merely set forth in the intended use clause of the preamble. Furthermore, it is unclear as to the relationship between “an outlet” in line 11 and “an outlet” set forth in line 3.

Furthermore, the language of the claim is directed to a method limitation that renders the claim vague and indefinite, as it is unclear as to the structural limitation applicant is attempting to recite by, “the combustion of the evaporated fluid generating an acoustic wave, said acoustic wave being used to draw the oxidizer from the first inlet into the chamber” and “a subsequent combustion being provided by a wavefront of the acoustic wave, after the device achieves operational temperature and operational acoustic frequency,” in lines 12-15. The wave characteristics as generated by the combustion are not considered elements of the apparatus but rather, process limitations. Also, it is unclear as to the relationship of “an acoustic wave” in line 12 and “a wavefront of the acoustic wave” in line 14 to “a pressure wave” set forth in line 11.

Regarding claims 2 and 3, it is unclear as to the structural limitation applicant is attempting to recite because “the oxidizer” and “the gas” are not elements of the apparatus.

Regarding claims 3, 5, 12 and 17, it is unclear as to which claims the dependent claims depend from, because claims 3, 5, 12 and 17 improperly depend from cancelled claim 2.

Regarding claim 8, it is unclear as to the structural limitation applicant is attempting to recite by the feed path being, “designed to aid evaporation”, because it is unclear as to what type of design aids evaporation.

Regarding claim 15, “engine throttle control” lacks proper positive antecedent basis. It is unclear as to the structural relationship of the “engine” to the other elements of the apparatus.

Regarding claim 14, it is unclear as to the relationship between “an inlet” in line 2 and the “first inlet” set forth in claim 1, line 8.

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Regarding claim 22, it is unclear as to which claim the dependent claim depends from, because claim 22 improperly depends from cancelled claim 21.

Regarding claim 27, it is unclear as to whether applicant is attempting to claim “A system for mixing and combusting chemicals” or the combination of “A system for mixing and combusting chemicals” and “a micro-machined chemical-mixing device”. Also, “the device” (line 3) lacks proper positive antecedent basis, because “a micro-machined chemical-mixing device” is merely set forth in the intended use clause of the preamble. Furthermore, it is unclear as to the relationship between “an outlet” in line 11 and “an outlet” set forth in line 3.

Furthermore, the language of the claim is directed to a method limitation that renders the claim vague and indefinite, as it is unclear as to the structural limitation applicant is attempting to recite by, “the combustion of the evaporated fluid generating an acoustic wave, said acoustic wave being used to draw the oxidizer from the first inlet into the chamber” and “a subsequent combustion being provided by a wavefront of the acoustic wave, after the device achieves operational temperature and operational acoustic frequency,” in lines 12-15. The wave characteristics as generated by the combustion are not considered elements of the apparatus but rather, process limitations. Also, it is unclear as to the relationship of “an acoustic wave” in line 12 and “a wavefront of the acoustic wave” in line 14 to “a pressure wave” set forth in line 11.

Regarding claim 28, it is unclear as to the relationship between “a membranous pad” in lines 1-2 and “a membranous pad” set forth in claim 27, line 15. Also, it is unclear as to the relationship between the “formations to increase surface adhesion... and flow...” in lines 2-3 and the “plurality of patterned holes and grooves for increasing surface adhesion... and flow...” set forth in claim 27, lines 15-17.

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Regarding claim 32, it is unclear as to whether applicant is attempting to claim "A system for mixing and combusting chemicals" or the combination of "A system for mixing and combusting chemicals" and "a micro-machined chemical-mixing device". Also, "the device" (line 3) lacks proper positive antecedent basis, because "a micro-machined chemical-mixing device" is merely set forth in the intended use clause of the preamble. Also, it is unclear as to the relationship between "an outlet" in line 11 and "an outlet" set forth in line 3. Also, the language of the claim is directed to a method limitation that renders the claim vague and indefinite, as it is unclear as to the structural limitation applicant is attempting to recite by, "the combustion of the evaporated fluid generating an acoustic wave, said acoustic wave being used to draw the oxidizer from the first inlet into the chamber" and "a subsequent combustion being provided by a wavefront of the acoustic wave, after the device achieves operational temperature and operational acoustic frequency," in lines 12-15. The wave characteristics as generated by the combustion are not considered elements of the apparatus but rather, process limitations. Also, it is unclear as to the relationship of "an acoustic wave" in line 12 and "a wavefront of the acoustic wave" in line 14 to "a pressure wave" set forth in line 11.

***Claim Rejections - 35 USC § 102 and § 103***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1, 3-5, 8, 10-12, 14, 17-19, 22, 26-28 and 32 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Young et al. (US 6,162,046).

Regarding claims 1, 3-5, 11, 27, 28 and 32, Young et al. discloses an apparatus comprising:

walls forming a chamber having an outlet (i.e., passageway **104**, defining a mixing chamber **100** and having a combustion zone **106** at its outlet; FIG. 4; column 16, lines 39-61);  
an evaporator (i.e., a vaporization zone comprising porous member **62** and hot seat assembly **72**; FIG. 3, 4; column 14, lines 24-45) adjacent and gaseously connected to chamber **100/104** for evaporating a fluid reactant supplied through a non-pressurized inlet (i.e., liquid fuel within ambient pressure reservoir **34** supplied through inlets/cutouts **56**; column 12, lines 24-37) and introducing the evaporated fluid reactant into the chamber **100/104**;

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a feed path for supplying the fluid reactant to the evaporator (i.e., via wick **50** within shroud **52** of the liquid feed system; FIG. 3, 4; column 13, line 12 to column 13, line 8);

an initiator for igniting the evaporated fluid reactant in the chamber (see column 17, lines 30-40);

and

a first inlet (i.e., via supply channel **102**; FIG. 4; column 16, lines 40-61) for introducing a non-pressurized oxidizer (i.e., ambient air) into the chamber **100/104** for forming a mixture of the evaporated fluid and the oxidizer; wherein the initiator provides the energy to combust **106** the mixture of the evaporated fluid and the oxidizer (see column 17, lines 30-61);

wherein the evaporator includes a membranous pad (i.e., the hot seat assembly **72** comprising vapor permeable members **74** and **76**, constructed, for example, from copper or a copper alloy, or other material having a high thermal conductivity; FIG. 3, 5A-C; column 14, lines 23-45; column 15, line 46 to column 16, line 2) having a plurality of patterned holes **84** and grooves **82**

The apparatus of Young et al. comprises each of the instantly recited structural elements, and therefore the apparatus of Young et al. structurally meets the claims.

Young et al. is silent as to operating the apparatus such that, “the combustion of the evaporated fluid generating an acoustic wave, said acoustic wave being used to draw the oxidizer from the first inlet into the chamber; a subsequent combustion being provided by a wavefront of the acoustic wave, after the device achieves operational temperature and operational acoustic frequency.” However, Young et al. further discloses that the particular wave characteristics of the combustion are controllable in the apparatus, as provided by, “an adjustable combustion



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output feature,” for modulating the combustion output by increasing or decreasing the flow of fuel to the combustion zone (column 17, lines 41-61; column 5, lines 31-33). In particular, “[t]he combustion output is generally modulated by increasing or decreasing the flow of vaporized and pressurized fuel into the burner assembly,” accomplished by, “modulating the heat flux in the combustion apparatus, and more particularly involves modulating the amount of heat energy returned to the vaporization/pressurization module,” see column 17, lines 41-62). Therefore, it would have been obvious for one of ordinary skill in the art in the time the invention was made to select an appropriate operation of the apparatus in order to achieve the instantly recited combustion wave characteristics, on the basis of suitability for the intended use.

Regarding claim 8, Young et al. discloses the feed path **50, 52** (FIG. 2, 3) comprises at least one channel (i.e., a plurality of capillary tubes; column 13, lines 12-40) for delivering the fluid to the evaporator.

Regarding claim 10, Young et al. discloses the evaporator may comprise, “[f]ibrous materials such as fiberglass mats, other types of woven and non-woven fibrous materials, and porous ceramic, low conductivity porous or fibrous metallic materials and porous metal/ceramic composites,” (column 10, lines 37-55). Young et al. further discloses the chamber comprising, “a rigid material having a generally high thermal conductivity, such as a copper or copper alloy,” (column 16, lines 57-61), and the initiator comprising, “[v]arious ignition systems, including catalytic initiation systems... adapted for use in combustion apparatus of the present invention,” (column 17, lines 30-40).” However, Young et al. is silent as to the materials for the chamber and initiator comprising, specifically, “silicon, plastic, ceramic, and glass based material.” In any event, it would have been an obvious design choice for one of ordinary skill in the art at the

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time the invention was made to select an appropriate material, such as the recited materials, for the components of the apparatus of Young et al., on the basis of suitability for the intended use and absent showing any unexpected results, because the use of such materials in high temperature or combustion apparatuses is well known in the art.

Regarding claims 12 and 14, Young et al. discloses the reactant fluids comprising at least two different fluids (column 6, lines 30-44) supplied to the evaporator by at least two separate inlets (i.e., the plurality of capillary tubes in feed path 50, 52 via inlets 56; column 13, lines 12-40), wherein the oxidizer is a gas supplied from outside the device (i.e., air at ambient temperature and pressure; FIG. 4; column 16, lines 40-61) and introduced to chamber 100/104 through an inlet passing through the walls of the chamber (i.e., via combustion gas supply channel 102) for mixing with the two different evaporated fluids within chamber 100/104.

Regarding claims 17 and 18, Young et al. discloses,

*"A steady state condition can be achieved and maintained wherein liquid fuel provided to the liquid feed surface of the porous member at substantially ambient pressures and temperatures is heated and pressurized within the vaporization/pressurization module using a portion of the heat generated in the burner to produce one or more pressurized vapor jets(s), which in turn are used for combustion,"* (column 5, lines 53-60)."

Although Young et al. is silent as to the apparatus comprising at least one temperature sensor and at least one pressure sensor, it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide such sensors to the apparatus of Young et al., on the basis of suitability for the intended use and absent showing any unexpected results, since the provision of temperature and pressure sensing elements to control systems for enabling the detection and subsequent control of process variables to a steady state is well known in the art.

Regarding claims 19 and 26, no valves, chemical pumps, pressurized chemical lines,

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pumps or moving mechanical parts are required for device operation (column 6, lines 54-61; see also column 3, lines 33-38).

Regarding claim 22, Young et al. discloses the evaporator preferably delivers vapor to the chamber **100/104** at a pressure greater than the pressure of liquid feed; the liquid feed pressure being substantially atmospheric (column 9, lines 25-36, 60 to column 10, line 14). Young et al. further disclose,

“... the *degree of vapor pressurization*, and amount of pressurized vapor released from the vaporization/ pressurization module may be modulated, for example, by varying the pore size of the porous member, by providing porous members having different thermal conductivity properties, by changing the configuration or arrangement of porous member **14**, by varying the number, size and/or location of vapor permeable apertures in the substantially vapor impermeable barrier, by modulating the amount of vapor release, and/or by adjusting the amount of heat provided to the vaporization zone,” (column 11, line 48 to column 12, line 6).

Young et al., however, is silent as to whether the chemical may be delivered to the chamber in a non-pressurized state. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to configure the evaporator of Young et al. to deliver the chemical to the chamber in a non-pressurized state, on the basis of suitability for the intended use, by merely varying the number, size and/or location of vapor permeable apertures, for instance, to allow for equalization of flow into and out of the evaporator, because it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (also, column 18, lines 13-49).

5. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Young et al. (US 6,162,046) in view of Loeb (US 1,753,897).

Young et al. discloses that the combustion may be initiated by, “[h]eating the burner

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assembly for a few seconds using a match or a lighter,” and furthermore, “[v]arious ignition systems... may *alternatively be adapted* for use in combustion apparatus of the present invention,” (column 17, lines 30-40). Thus, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate, alternative ignition system (i.e., such as the instantly recited “spark or glow wires”) for the initiator in the apparatus of Young et al., on the basis of suitability for the intended use, because such initiators are well known in the art, as evidenced by Loeb (i.e., electrodes **h**, **k**, inherently comprising spark wires; lines 26-43), and furthermore, substitution of known equivalent structures involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *In re Ruff* 118 USPQ 343 (CCPA 1958).

### ***Response to Arguments***

6. Applicant's arguments have been fully considered but they are not persuasive. In the response submitted on March 4, 2005 (see page 7, fifth paragraph), applicant argues,

“... nowhere does Young teach, suggest, or disclose (i) an initiator providing energy to combust a mixture of evaporated fluid and an oxidizer to send a pressure wave through an outlet; (ii) the combustion of the evaporated fluid generating an acoustic wave, where the acoustic wave is used to draw the oxidizer from the first inlet into the chamber; and (iii) a subsequent combustion being provided by a wavefront of the acoustic wave, after the device achieves operational temperature and operational acoustic frequency.”

The Examiner respectfully disagrees. Regarding the provision of an initiator, Young et al. discloses the apparatus comprising an initiator (see column 17, lines 30-40). In particular,

“Heating the burner assembly for a few seconds using a match or a lighter provides sufficient heat transfer to the hot seat and porous member to initiate vaporization and

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pressurization of fuel in the porous member, produce a vaporized fuel jet, and initiator combustion... Various ignition systems, including catalytic ignition systems, may alternatively be adapted for use in the combustion apparatus of the present invention.”

Regarding the wave characteristics as generated by a combustion and subsequent combustion of the apparatus, Young et al. further discloses that the particular wave characteristics of the combustion are controllable in the apparatus, as provided by, “an adjustable combustion output feature,” for modulating the combustion output by increasing or decreasing the flow of fuel to the combustion zone (column 17, lines 41-61; column 5, lines 31-33). In particular, “[t]he combustion output is generally modulated by increasing or decreasing the flow of vaporized and pressurized fuel into the burner assembly,” accomplished by, “modulating the heat flux in the combustion apparatus, and more particularly involves modulating the amount of heat energy returned to the vaporization/pressurization module,” see column 17, lines 41-62). Therefore, it would have been obvious for one of ordinary skill in the art in the time the invention was made to select an appropriate operation of the apparatus in order to achieve the instantly recited combustion wave characteristics, on the basis of suitability for the intended use.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung  
July 18, 2005 *ml*

*Hien Tran*  
**HIEN TRAN**  
**PRIMARY EXAMINER**